



OFFICE OF RESEARCH INTEGRITY
600 Suffolk St, Wampanoag Mills Suite 212
Lowell, MA 01854
T: 978-934-4134 F: 978-934-6012
<https://www.uml.edu/research/integrity/>

12/16/2021

Fred Martin
Computer Science
198 Riverside St
Olsen Hall 2nd & 3rd Floors
Lowell, MA 01854-
(978) 934-1964
fredm@cs.uml.edu

Dear Fred Martin, PhD:

The IRB approved the following on 12/16/2021:

Type of review:	Initial
Title:	Studying Secondary Students' Learning of Artificial Intelligence in an Afterschool Program
Principal investigator:	Fred Martin, PhD
IRB number:	21-211
Level of Review:	Expedited Category #6, 7
IND or IDE, if any:	N/A
Funding Source, if any:	N/A
Documents reviewed:	HRP-200, HRP-504, Parent consent, Assent, Pre_Post Assessment, Promotional description, Curriculum Assessment & Interview prompts, Student demographics

This research is reviewed under the 2018 regulations. It is neither FDA nor DOJ regulated

The IRB determined that the research presents no greater than minimal risk to children (45 CFR 46.404) and there are adequate provisions for soliciting assent (45 CFR 46.408) and the permission of the parents/guardians (45 CFR 46.408).

Copies of any approved consent documents, consent scripts, or assent documents are attached.

In conducting this research, you are required to follow the requirements in "[HRP-070 Policy: Investigator Obligations](#)." The Principal Investigator is responsible for submitting an "[HRP-215 FORM - Closure Report](#)" and any applicable documents to close the study.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Elyse', written over a horizontal line.

Emily Sousa, MA, CIM, CIP
IRB Manager

Learning AI Afterschool - promotional description

"How Artificial Intelligence Really Works"

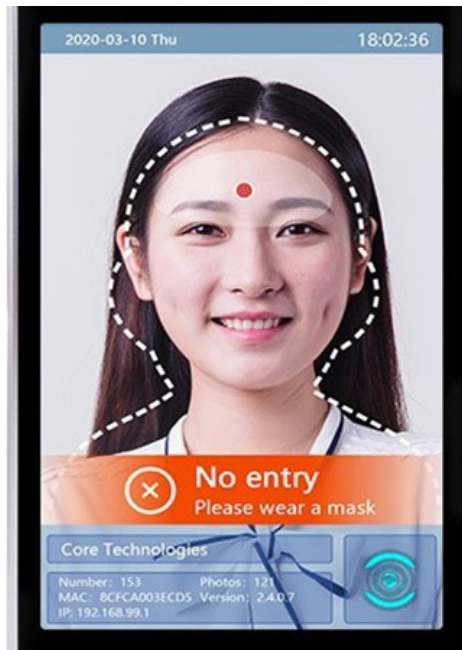
An after-school program for 7th and 8th grade students
At the Bartlett Community Partnership School

Mondays and Wednesdays

February 28, 2022 - April 6, 2022

2:15 PM to 4:00 PM

(no meeting Wed Mar 9; 11 total meetings)



Are you curious how AI (Artificial Intelligence) works?

- Learn how computers make decisions
- See how computers recognize images
- Use AI responsibly in everyday life
- Explore a variety of AI software tools

You'll create a project that uses AI to solve real problems. No coding experience needed!

This program includes a research study to investigate students' attitudes towards AI. At each meeting, students will complete short surveys and interviews to share their ideas about AI.

Contact Mr. McKellar or Mrs. Crawford for more information!

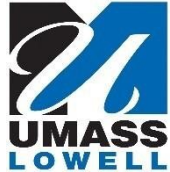
Full list of meeting dates: (1) Mon Feb 28; (2) Wed Mar 2; (3) Mon Mar 7; (4) Mon Mar 14; (5) Wed Mar 16; (6) Mon Mar 21; (7) Wed Mar 22; (8) Mon Mar 28; (9) Wed Mar 30; (10) Mon Apr 4; (11) Wed Apr 6, 2022. All meetings at the Bartlett School from 2:15 PM to 4:00 PM.



Learning with Purpose

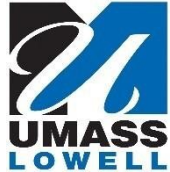
How Artificial Intelligence Really Works is led by professors and students from UMass Lowell.

If you have any questions or would like more information, please contact Prof. Fred Martin at fred_martin@uml.edu or via voice/text at 978-254-7532. Thank you!

	Application for Initial Review	
	Date Received	IRB Docket #
	12/13/2021	21-211-MAR-XPD

Use for newly proposed research							
Study Nickname:	Learning AI Afterschool						
Study Title:	Studying Secondary Students' Learning of Artificial Intelligence in an Afterschool Program						
Principal Investigator:	Fred Martin						
PI Department:	Computer Science						
Date of CITI Training:	2021-02-15	Degrees	PhD	Involved in Consent?	X	Financial interest related to the research? Yes* <input type="checkbox"/> No X	
Email Address:	fred_martin@uml.edu			Phone #:	x-1964		Cell: 978-254-7532
Additional Contact:				Phone #:			Cell:
Check here if you wish to be added to the UML IRB Listserv: <input type="checkbox"/>							
Check here if you wish to add all personnel to the UML IRB Listserv: <input type="checkbox"/>							

Names of all UML Personnel involved in the design, conduct, or reporting of the research					
Date of CITI Training	Name & Email Address	Degrees	Role in the research	Involved in consent?	Financial interest related to the research?
2021-11-03	Ruizhe Ma, ruizhe_ma@uml.edu	PhD	co-investigator	<input type="checkbox"/>	Yes <input type="checkbox"/> No X
2021-10-20	Ismaila Sanusi, ismaila.sanusi@uef.fi	MEd	visiting doctoral researcher	X	Yes <input type="checkbox"/> No X
2020-04-09	Joseph Gonzales, joseph_gonzales@uml.edu	PhD	co-investigator	<input type="checkbox"/>	Yes <input type="checkbox"/> No X
2021-09-19	Vaishali Mahipal	BTech	graduate RA	<input type="checkbox"/>	Yes <input type="checkbox"/> No X
				<input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
				<input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
				<input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
				<input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
				<input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>

	Application for Initial Review				
	Date Received		IRB Docket #		
	12/13/2021		21-211-MAR-XPD		
				<input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>

- "Immediate Family" means spouse, domestic partner, children, parents, spouse's parents, and dependents.
- "Financial Interest Related to the Research" means any of the following interests in the **sponsor, product or service being tested, or competitor of the sponsor** held by the individual or the individual's immediate family as defined above:
 - Ownership interest of any value including, but not limited to stocks and options, exclusive of interests in publicly-traded, diversified mutual funds.
 - Compensation of any amount including, but not limited to honoraria, consultant fees, royalties, or other income.
 - Proprietary interest of any value including, but not limited to patents, trademarks, copyrights, and licensing agreements.
 - Board or executive relationship, regardless of compensation.

*If yes, you must complete the disclosure process by contacting Disclosures@uml.edu

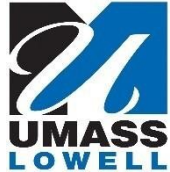
Funding Sources	
Name of Funding Source	Grant Identifier

Additional Information	
UML Location(s) where subjects/participants will be seen.	Bartlett Community Partnership School 79 Wannalancit St, Lowell, MA 01854
Additional Departments involved in the study.	Computer Science; Psychology
Key Words	Artificial intelligence; data science; machine learning; education research
Is this research required to be registered on ClinicalTrials.gov?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Consumer/Lay Summary of Study – limit to 3 succinct sentences/300 characters: The purpose of the study is to introduce secondary school students to the field of Artificial Intelligence (AI) and learn how their attitudes towards AI change. The study aims to test a 15- to 20-hour curriculum and learn about the accessibility of ideas in AI to students of this age group.	

Investigator Acknowledgment	
<p>The following check boxes must be checked before sending:</p> <p>By checking below you are verifying that:</p> <ul style="list-style-type: none"> ● Yes X You have obtained the financial interest status ("Yes" or "No") for each member of the research staff. ● Yes X You have obtained the agreement of each research staff to his/her role in the research. ● Yes X You have obtained the agreement, if applicable, of any other department (outside of your own department) being asked to serve as a recruitment or study conduct site. pending approval of study ● Yes X You will conduct this Human Research in accordance with requirements in the INVESTIGATOR MANUAL (HRP-910). ● Yes X You have received appropriate approvals from your department chair or supervisor and it has been determined that all departmental requirements are met and that the investigator has adequate resources to conduct this Human Research in terms of time, facilities, staff, access to a subject population, and resources for care that subjects may need. 	
X By checking here, I attest that the information provided in this form is accurate.	Date: 2021-12-05

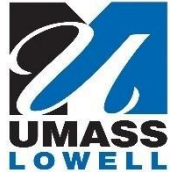
Submit all documents to IRB@uml.edu

- FORM: Application for Initial Review (HRP-200), including as applicable:
 - Appendix A: External Site Approvals

	Application for Initial Review	
	Date Received	IRB Docket #
	12/13/2021	21-211-MAR-XPD

- Appendix B: Drugs and Device (include associated attachments, such as package insert, investigator brochure, or labeling, verification of IND/ IDE number)*
- Investigator Study Plan (See TEMPLATE (HRP-504) for instructions)
- All information intended to be seen or heard by subjects, including: (Advertisements and recruitment materials and changes to advertisements and recruitment materials must be IRB approved before their use)
 - Evaluation instruments and surveys
 - Advertisements (printed, audio, and video)
 - Recruitment materials and scripts
 - Consent documents
 - If consent will not be documented in writing, a script of information to be provided orally to subjects
 - Foreign language versions of the above
- Complete sponsor protocol (if applicable)
- Grant application, if any
- DHHS protocol and DHHS-approved sample consent document, if any

Appendix A: External Sites Involved in the Research			
Complete for each non-UML site where the investigator will oversee or conduct the research			
Site name:	Lowell Public Schools		
Site PI name:	Fred Martin		
Contact phone :	978-674-2164	Contact email:	aanderson@lowell.k12.ma.us
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Will the external site review the research?		
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Will the external site rely on the UML IRB?		
Site name:			
Site PI name:			
Contact phone :		Contact email:	
Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site review the research?		
Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site rely on the UML IRB?		
Site name:			
Site PI name:			
Contact phone :		Contact email:	
Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site review the research?		
Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site rely on the UML IRB?		
Site name:			
Site PI name:			
Contact phone :		Contact email:	

	Application for Initial Review	
	Date Received	IRB Docket #
	12/13/2021	21-211-MAR-XPD

Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site review the research?		
Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site rely on the UML IRB?		
Site name:			
Site PI name:			
Contact phone :		Contact email:	
Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site review the research?		
Yes <input type="checkbox"/> No <input type="checkbox"/>	Will the external site rely on the UML IRB?		

INVESTIGATOR STUDY PLAN - REQUIRED

INSTRUCTIONS:

- **Provide information once.** It's better to refer to earlier items (e.g., "See #...") than to repeat.
- **If an item does not apply, type "NA."**
- **Delete the instructions in the brackets as you answer each item.**
- **Use a version number or date in the file name.**

1. TITLE

Full title: Studying Secondary Students' Learning of Artificial Intelligence in an Afterschool Program

Short version: Learning AI Afterschool

2. EXTERNAL IRB REVIEW HISTORY*

N/A

3. PRIOR APPROVALS:

N/A

CONFLICT OF INTEREST (COI):

N/A

BIOHAZARDOUS AGENTS:

N/A

RADIATION:

N/A

4. BACKGROUND*

Given the importance of Artificial Intelligence (AI) in today's world, discovering ways to communicate AI-related concepts to secondary students is valuable. Here, we define AI as the set of techniques involved in automated decision-making, and include ideas related to Machine Learning (ML) and Data Science (DS).

The planned curriculum and assessments will aid to understand which pedagogical principles work best, uncover the kind of datasets that stimulate students to learn machine learning, and how existing tools support teaching of these concepts. The curriculum will introduce the web-based tools Google's Teachable Machine (teachablemachine.withgoogle.com), which "makes creating machine learning models fast, easy, and accessible to everyone," and iSENSE, developed at UMass Lowell (isenseproject.org), for sharing and visualizing scientific data.

INVESTIGATOR STUDY PLAN - REQUIRED

In the context of an six-week afterschool program for middle school students (grades 7 & 8), the study aims to demonstrate that students can understand applications of artificial intelligence, how machine learning algorithms operate, and ethical considerations regarding use of these tools. The study will also examine how the curriculum influences their interest in these technologies and in STEM careers.

5. OBJECTIVES*

The program will meet twice weekly in an afterschool setting for 75 minutes per meeting and for six to eight weeks. Students will be taught how to make sense of data, introducing them to data types, machine learning algorithms including clustering and decision trees, and algorithmic bias. Students will be taught about ethical concerns in machine learning projects. To conclude the program, students will develop their own project using a curated dataset for data visualization and modelling.

The hypothesis to be tested is that an engagement with artificial intelligence, machine learning, and data science concepts will (1) increase students' technical understanding and confidence in this material; (2) encourage students to further pursue these ideas as part of their lives and as well inspire their future career; and (3) that these changes will be consistent across some demographic indicators such as gender and race/ethnicity.

6. STUDY OUTCOMES*

Per the hypothesis stated above, the primary outcomes of the study are the items #1 and #2 (positive changes in students' experience toward machine learning and its impact on learning outcomes). A secondary outcome is item #3 (changes that are consistent across gender and race/ethnicity variables).

There are no safety endpoints.

7. INCLUSION AND EXCLUSION CRITERIA*

The study participants are middle students (7th to 8th graders). Consent will be obtained from a parent/guardian, and assent will be obtained from participants since these participants are minors.

For students who have English as a second language, a classroom teacher from Lowell Public Schools will be present at all program meetings. This teacher will have experience working with diverse populations and will assist students who need extra help.

8. VULNERABLE POPULATIONS*

The study population is middle school students who are minors. As the study will pose no more than minimal risk, we will obtain consent from one parent/guardian only.

Assent will be obtained from the study participants via an online form, and consent will be obtained from their parent or guardian via a written form. To support obtaining consent from parents who may not read English, we will provide translated versions of the informed consent materials upon request. Our contact information (email and cell numbers) for questions will be

INVESTIGATOR STUDY PLAN - REQUIRED

provided. The parent/guardian will complete the consent materials at home; they will receive them along with the informational flyer describing the program opportunity. These will be supplied about a month before the program start date. Students will complete the assent form at the program's first meeting.

The only information contained in the forms will be the participant's and parent/guardian's name.

9. SETTING

The study will be conducted as an after-school program in Lowell Public Schools. Participants will engage in the sessions in a classroom designated by the school.

Participants will be recruited by Lowell Public School partners. We are working with Carolyn Rocheleau, Special Programs Coordinator in the Office of Teaching & Learning.

The research team is working at UMass Lowell. Data analysis will take place on-campus and remotely, with members of the research team working from their homes.

All study researchers who will have classroom contact with students will have a CORI background check administered by Lowell Public Schools. The \$35 per-person fingerprinting fee for this service will be paid out of the faculty researchers' existing discretionary funds.

10. RESOURCES AVAILABLE

The research study will be conducted by the project research staff and UMass Lowell undergraduate research assistants as described below. Additionally, a Lowell Public Schools teacher and a UMass Lowell undergraduate assistant will be available to help with classroom management and teaching and learning during the program. These two individuals will not be part of the research.

Study personnel:

Principal Investigator (PI). The PI will be a faculty member who will lead the research and is responsible for ensuring that the plan described here is carried out. They will supervise the visiting doctoral researcher and the graduate student research assistant. The PI has an advanced degree and prior experience in educational research. The PI will lead the parent consent process. The PI will devote three to five hours per week to the study.

Co-PI in Educational Research. The co-PI in educational research will have a background in quantitative and qualitative research methodologies. In this project, they will be primarily responsible for administration of the quantitative instrument and provide guidance for the team in analyzing qualitative data. They will be responsible for supervising the undergraduate research assistants. This co-PI will devote three to five hours per week to the study.

Co-PI from Computer Science. The co-PI in computer science will have primary disciplinary expertise in data science, machine learning, and artificial intelligence. They will lead development of key curriculum modules, including the clustering, KNN and image recognition

INVESTIGATOR STUDY PLAN - REQUIRED

units. They will be involved in administration of the program and analysis of the data. This co-PI will devote three to five hours per week to the study.

Visiting doctoral researcher. A visiting doctoral researcher will oversee all curriculum activities. They will lead the process of daily data collection during program meetings, which will include administration of written instruments and structured interviews. They will be centrally involved in the data analysis, both quantitative and qualitative. The visiting doctoral researcher will lead the student assent process. They will devote 10 to 20 hours per week to the study.

Graduate student research assistant (grad RA). Under the direct supervision of the PI, the grad RA will lead specific curriculum modules, both developing the module and its associated technology and conducting classroom instruction. They will assist with subsequent data analysis. They will all complete the CITI training. The Grad RA will each devote six to ten hours per week to the study.

Undergraduate Research Assistants (ugrad RAs). A small team of undergraduate students (1 to 4 persons) will assist the PI team. They will particularly be involved in conducting structured interviews with project participants at the end of each program session. They will also assist with data analysis subsequently (e.g. assisting with coding data). The ugrad RAs will be recruited and added to the study protocol in January 2022. They will all complete the CITI training. Some may work for hourly pay and others will earn academic credit enrolled in Psychology's Research Service Learning course, PSYC.4880. The undergrad RAs will each devote four to six hours per week to the study.

11. STUDY TIMELINES*

The program will launch in late February 2022 and run for six weeks. Study participants will meet twice a week for the duration of their respective program.

Over the twelve sessions, participants will be introduced to the importance of understanding data, data types, algorithm classification, supervised machine learning, algorithm bias, including ethics.

Timeline:

December 2021

UMass Lowell IRB approval obtained for study.

January 2022

Approval requested of Lowell Public Schools for study. We are working with Abigail Anderson, Director of Accountability and Research.

CORI forms submitted for study personnel to have permission to work in the school buildings.

February – April 2022

Program runs in Lowell Public Schools and data are collected.

May – August 2022

Data analysis and research written up.

INVESTIGATOR STUDY PLAN - REQUIRED

12. NUMBER OF SUBJECTS*

We anticipate recruiting 15 to 20 participants. All participants who qualify will be admitted. Qualification is defined as being an active middle school (grades 7- 8) student in the Lowell Public Schools who provides assent, obtains parental consent.

13. PROCEDURES INVOLVED*

To measure students' learning, we will use the following instruments and approaches:

- [Learning AI Afterschool student demographic survey](#) This instrument measures basic demographic information about students: grade in school, gender identity, ethnicity, and first-generation status. This will be administered via a Qualtrics survey. Students will bring their school-issued Chromebooks to the program each day and these machines will be used to conduct all survey activities (as well as program activities that use browser-based software tools).
- [Learning AI Afterschool pre-post AI assessment.docx](#) This instrument measures students' motivations, attitudes, and conceptions of artificial intelligence. It consists of nine Likert scale survey items and five open-ended prompts. It will be administered in a pre/post format, at the beginning and end of the program, in a Qualtrics survey.
- [Learning AI Afterschool - Curriculum Assessments and Interview Prompts](#) This instrument consists of daily brief written reflections on program activities. Students will enter their responses into a Qualtrics survey.
- [Learning AI Afterschool - Curriculum Assessments and Interview Prompts](#) This instrument is 10-minute structured interview prompts which will be conducted daily. These interviews will be audio-recorded.
- Analysis of student artifacts. Some curriculum activities will include hand-written activities on paper; others involve students taking measurements and writing them on paper and subsequently entering them into an online data visualization platform. Rubrics for analyzing these student works will be developed and submitted for approval subsequently.

Researchers will generate a table that maps participants to random identifiers that will be provided to participants prior to completion of each instrument. For in-classroom administration, a deck of index cards will be created with each student's name on one side and identifier on the other. These cards will be handed to students prior to survey/interview administration and collected thereafter. The code word will also be spoken at the start of structured interview recordings. Participants will enter their unique identifier into the survey forms, preserving anonymity. The table will be securely stored on OneDrive, accessible only to the study staff.

At the first program session, students will be given their unique identifier and will complete the demographic survey and pre-survey.

INVESTIGATOR STUDY PLAN - REQUIRED

At the first session, students will be informed of a participation incentive: upon successful completion of the program, they will receive a T-shirt from the University of Massachusetts Lowell. They will need to complete pre-surveys and post-surveys and have attended at least eight of the eleven program sessions.

At each program session, students will complete the written curriculum assessment at the end of the day's activities.

Each program meeting will be scheduled for 1 hour and 45 minutes. Researchers will conduct structured interviews with the students during the final 15 minutes of each meeting. Each interview will last about 7 minutes. These will be audio-recorded. The interviews will be conducted in parallel, with half the students being given a short activity while the other half of the group meets with the research team. The groups will then swap. We anticipate eight researchers being present at each meeting, giving us the capacity to interview 16 students per session. If there are more than twice the number of students than researchers present in any session, we will conduct some interviews with pairs of students so that all students are interviewed.

Survey data will be captured by Qualtrics and transferred to a project folder on OneDrive for storage and analysis. The interviews will be recorded on researchers' personal cell phones. Immediately after each program meeting, the recordings will be transferred to the project folder on OneDrive for storage. At the end of each week, researchers will verify that recordings were successfully uploaded to OneDrive and then they will delete their local phone recordings.

At the end of the study, the table mapping student real names to code words and the corresponding index card deck will be destroyed.

14. RECRUITMENT METHODS*

We will use the following promotional description of the program for recruiting students:

[Learning AI Afterschool - promotional description](#)

We are working with Rachel Crawford, a music teacher who coordinates afterschool programs at the Bartlett Community Partnership School, and Mark McKellar, a science teacher. Our school contacts will send the flyer home with students along with the parent consent form. They will also post the flyer in the hallways to attract other students who may be interested.

Our goal is 15–25 participants.

15. CONSENT PROCESS*

All study staff have completed the CITI training and are familiar with and will follow [HRP-802 INVESTIGATOR GUIDANCE: Informed Consent](#). The consent process will occur online as described below.

Interested students will ask a parent to complete a paper-based consent form. The consent form will ask for a parent / guardian name and contact phone number. Students will bring the consent form to a teacher in the school, who will provide the forms to the research team.

INVESTIGATOR STUDY PLAN - REQUIRED

Participants will be accepted on a rolling basis from the initial time of advertising the study until the first meeting. Participants will be welcome to leave the study at any time and will be informed about this.

At the first program meeting, students will be asked to provide assent to participate in the study. This assent question will be integrated into the demographic survey as the first item. If a student declines to participate, their demographic information will not be collected.

However, as every other survey (and the structured interviews) is an integral part of program activities (i.e., they are embedded assessments), we will have all students complete them regardless of whether they are study participants. We will discard data from students who are not enrolled in the study.

16. PROCESS TO DOCUMENT CONSENT IN WRITING

Per above, a parent or guardian will sign the a paper-based consent form and students will complete a Qualtrics-based assent form. The study PI will store the paper consent forms in their office.

17. WITHDRAWAL OF SUBJECTS WITHOUT THEIR CONSENT*

N/A

18. SHARING OF RESEARCH RESULTS WITH SUBJECTS*

When the study results are documented, a copy will be made available to school officials for distribution to parents upon request.

19. RISKS TO SUBJECTS*

The risks to subjects participating in this study is no more than minimal. There is a risk for stress or disclosure. Students may become frustrated if they do not understand AI or the program activities. There is also the risk for inadvertent disclosure of student data from the survey instruments, prompt tasks and interviews. This risk is mitigated by using randomized identifiers on the survey instruments and anonymization during analysis.

20. POTENTIAL DIRECT BENEFITS TO SUBJECTS*

Students will gain experience in artificial intelligence and may benefit from increasing their knowledge of this subject.

21. DATA AND SPECIMEN ANALYSIS AND MANAGEMENT*

Data will be received on UMass Lowell's Qualtrics system. Students will be provided with a unique key which they will use as a confidential identifier when filling out the surveys. A single file containing the students' names and the confidential identifiers will be maintained by the researchers and kept in a project folder on UMass Lowell's OneDrive. This file will be encrypted by the researchers when not in use. The index card decks with students' names and identifiers will be managed by the doctoral visiting researcher during the duration of the study.

Survey data from Qualtrics will be transferred to UMass Lowell's OneDrive for storage and analysis. Using folder permissions in OneDrive, only the PI and approved researchers will have

INVESTIGATOR STUDY PLAN - REQUIRED

access to the data. Any data brought down to an individual researcher's personal computers for analysis will be deleted after it is placed back on OneDrive.

The PI will create weekly backups of the OneDrive project folder on an encrypted USB drive which they will store in a locked office.

Data will be kept for four years after the study concludes for potential use in further research.

The study uses a matched pre/post survey design. A randomized, unique identifier will be provided to each student before they complete the pre-survey, and the same identifier will be provided to each student before they complete the post-survey.

The data analysis will use a matched-samples t-test to determine statistically significant differences in the pre/post survey results.

22. PROVISIONS TO MONITOR THE DATA TO ENSURE THE SAFETY OF SUBJECTS*

N/A

23. DATA AND SPECIMEN BANKING*

Per #21, we plan to keep the deidentified pre- and post- survey results for possible future use and interviews. After the study concludes, student researcher access to the data will be removed, and only the PI will have access to the data.

The survey data will be deleted four years after the study concludes. There is no plan to provide access to the data to other parties.

24. CONFIDENTIALITY

The data will consist of student responses to the open-ended questions, recorded interviews and demographic items in the instruments provided. Pre- and post-matching of surveys will be accomplished by having study participants enter a unique key which is provided to them individually immediately before completing the instruments and interview. As such, the data gathered will be de-identified upon the point of collection.

25. PROVISIONS TO PROTECT THE PRIVACY INTERESTS OF SUBJECTS

Information gathered by the study will be limited to only that which is required for the study design.

26. COMPENSATION FOR RESEARCH-RELATED INJURY

N/A

27. ECONOMIC BURDEN TO SUBJECTS

N/A

28. COMMUNITY-BASED PARTICIPATORY RESEARCH*

N/A

INVESTIGATOR STUDY PLAN - REQUIRED

29. MULTI-SITE RESEARCH*

N/A

30. RESEARCH CONDUCTED IN A FOREIGN COUNTRY

N/A

31. DRUGS OR DEVICES

N/A

INVESTIGATOR STUDY PLAN - REQUIRED

IRB Checklist

This checklist is provided for your convenience and is not a requirement for review.

[illegible]

INVESTIGATOR STUDY PLAN - REQUIRED

Learning AI Afterschool: Curriculum, Assessments, and Interview Prompts

Teachable Machine

Students train Google's Teachable Machine (teachablemachine.withgoogle.com) to recognize fishes as being either safe or poisonous, and study how features are extracted from the fish images.

Written assessment:

- How successful is Teachable Machine in recognizing which fish are poisonous and non-poisonous?
- Sometimes the model gets Fish 4 wrong. Examine the training samples and think about why Fish 4 is particularly hard for the model?
- What other applications do you think use AI in this way in your everyday world?

Structured interview prompts:

- Compare Teachable Machine's output with your own conclusions from the unplugged activity. Does the model agree with you?
- Does varying the size of your input data impacts accuracy? What else could impact accuracy? Why?
- What applications could you see for the future using supervised learning and classification?
- What did you find interesting about this activity? Why?

iSENSE: measuring faces

Students use cloth rulers to measure features of their face (or those of famous people's faces)—e.g., distance between the eyes, overall width and height—and enter the measurements into iSENSE (isenseproject.org) for analysis. They compare how different ratios are correlated with psychological perceptions of people's approachability and other characteristics.

Written assessment:

Thinking about the relationships between facial measurements and personality quizzes you tested today, which did you find were most strongly related to each other?

How were you able to compare relationships between measurements to determine whether a relationship was strong or weak?

What limitations does correlation have in understanding how different measures are related?

Structured interview prompts:

Were you surprised by the results of any of the relationships you tested today? Why?

Thinking back to the results of any of the relationships you tested today, describe some ways you could use the test results to make predictions.

What other measures would you like to test for relationships? Why?

Can you imagine a problem or question where correlation could be used to come up with a solution or answer? What are the steps you would take to use correlation to address this problem or question?

iSENSE: measuring density

Students use digital scales and graduated cylinders filled with water to measure the mass and volume of different objects—e.g, plastic toys, glass marbles, and zinc/steel washers. They calculate density (defined as mass divided by volume) and for each object, enter its data (mass, volume, density) into iSENSE (isenseproject.org) for comparison with others' data.

Written assessment:

What patterns did you notice about the density of different objects based on the objects' material type?

You may have noticed some measurements that didn't follow the pattern of other objects of the same material type. What are some reasons this could have happened?

If you were given density measurement of an unknown object, could you guess the object's material type using the measurement data you gathered? Explain your answer.

Structured interview prompts:

After collecting data to calculate density of these objects, how many ways do you think the measures taken could have been incorrect?

What benefits might there be from having an object measured more than once?

If I gave you the density and other measurement data for four unidentified objects, how would you use the data collected today to guess what type of material each unidentified object was made from?

What factors would increase or decrease your likelihood of correctly guessing the material type of the unidentified objects?

KNNs

Students are taught the algorithm for performing "K-Nearest Neighbors" and use it to analyze differing groups of objects.

Written assessment:

Why is kNN called lazy learner?

Are we always capable of finding the nearest neighbor(s)? Why or why not?

What do you think happens at the extremes, say 1-nearest neighbor vs. 100-nearest neighbor?

Structured interview prompts:

What did you like or find interesting about this activity?

Can you think of an advantage and a disadvantage with using the kNN?

What other type of data would you like to investigate?

Clustering

Students are taught the algorithm for performing clustering and use it to analyze differing groups of objects when only the measurements are given.

Written assessment:

Why is clustering called unsupervised learning?

What is the goal for clustering?

Did you find any interesting patterns?

Structured interview prompts:

Are we guaranteed to find interesting patterns with clustering?

Compared to kNN, what would you say is the main difference with clustering?

Other than the introduced approach, can you think of any other ways of clustering similar data together?

Do you think we can cluster images or videos?

Decision Trees in Pastaland

Students create their own binary decision tree for distinguishing different types of pasta (spaghetti, macaroni, ziti). They compare their choice and sequence of differentiating questions with those of others. They explore if their decision tree is biased to classify only certain types of pasta.

Written assessment:

How was your Pastaland decision tree different from your classmates' trees?

Was your tree lop-sided or symmetric? Why was it this way?

What other things could you characterize with decision trees?

Structured interview prompts:

What did you like or find interesting about this activity?

How did your tree handle the surprise pasta - do you think grouped it with other pasta shapes properly?

If your tree was even/symmetric - why do you think this was so?

If your tree was lop-sided - why do you think this was so?

Pop Culture Data Science

Using an Android app on provided tablets, students give thumbs-up or thumbs-down ratings to 54 different images (memes, foods, and fashion items). Then they use iSENSE to explore the collective data, asking questions like “what are the most / least favorite items” and “which shoes are most popular?”

Written assessment:

Which are the three most popular items?

Which are the three least popular items?

Which result is most surprising to you?

What question do you have about the data? Were you able to answer it?

Structured interview prompts:

What did you like or find interesting about this activity?

Did you find any differences in how different groups of people preferred/disliked items?

How would you change the activity to make it better?

Quick, Draw! Image Recognition

Students use a web-app inspired by Google’s Quick, Draw! (quickdraw.withgoogle.com) which prompt you to draw everyday objects and lets you know when you’ve successfully drawn it. They complete a paper-based activity which explains how neural networks perform image recognition.

Written assessment:

Did the app make any mistakes?

Why do we use kernels and pooling in image recognition?

What other areas do you think image recognition is or can be applied to?

Structured interview prompts:

Were you able to fool the app?

How do you think you recognize an image or an object?

Do you think AI is able to recognize images the same as humans?

Ethics of Facebook

Students discuss in what ways Facebook is good or bad for society, including focus on its image recognition and other automated moderation technologies.

Written assessment:

- What will you take away from this activity?

- What's the one thing you've learned in this session that will be most applicable to your everyday life?
- What is one thing you'll do differently following this activity?

Structured interview prompts:

- What did you find interesting about this activity?
- Do other student ideas made you think about your stance differently? Even though you thought you had a right stance at the beginning.
- If you were to make an app where networks of users could share geolocations for house parties—what users might have issues or who may this harm?

Penguin dataset

Using iSENSE, students explore the Palmer Archipelago (Antarctica) penguin dataset, looking for correlations between penguin measurements (e.g., body mass; flipper length) and penguin species (Adelie, Chinstrap, or Gentoo).

Written assessment:

Which measurement(s) distinguishes the Adelie penguin (from the other two)?

Which measurement(s) distinguishes the Chinstrap penguin (from the other two)?

Which measurement(s) distinguishes the Gentoo penguin (from the other two)?

Structured interview prompts:

Do you think different features/measurement pairs tell you varying information or do you think all feature pairs behave similarly?

Which type of visualization do you like the most? Why?

What other type of animal data would you like to see visualized?

Learning AI Afterschool student demographic survey

Q1. What is your grade?

6th
7th
8th
9th
10th
11th
12th

Q2. With which gender do you most identify?

Female
Male
Other (fill in)
Prefer not to answer

Q3. What is your ethnic background? Please select all that apply.

Asian - Eastern
Asian - Indian
Black - African-American, Afro-Caribbean, or African
Hispanic / Latinx
Mixed race
Native American
White / Caucasian
Other (fill in)
I prefer not to say

Q4. Did either of your parents or guardians go to college?

No, neither parent / guardian went to college
Yes, one of my parents / guardians went to college
Yes, both of my parents / guardians went to college
Not sure
Prefer not to say

Learning AI Afterschool

AI Motivations, Attitudes, and Conceptions Assessment (pre/post)

Definition of Artificial Intelligence:

Artificial Intelligence (AI) is a set of approaches so that computers can make automatic decisions based on pictures, sounds, and other information they are provided.

Please indicate your agreement with each of the following statements.

Strongly Agree (1)

Somewhat Agree (2)

Neither Agree/Disagree (3)

Somewhat Disagree (4)

Strongly Disagree (5)

Personal Value (2)

Understanding how Artificial Intelligence works can help me to understand today's world.

Understanding how Artificial Intelligence works can help me get a good job.

Social Value (1)

Understanding how Artificial Intelligence works is useful for solving the problems of everyday life.

Aspiration (1)

I would like to learn more about how to use Artificial Intelligence.

Interest (1)

The challenge of solving problems using Artificial Intelligence appeals to me.

Gender (1)

Men and women are equally capable of using Artificial Intelligence to solve problems.

Related Skills/Concepts (3)

I am good at problems that can be solved in many different ways.

I like thinking of new and better ways of doing things.

I would like a job that would let me spend time working with computers.

Open-ended prompts (pre):

1. What are some common things you see or use everyday that have AI concepts in them?
2. Is AI important to you? If so, how?
3. How would you like to use AI technology in your daily life?
4. What concerns do you have (if any) with the ethics or social effects of AI?
5. Have you studied AI in the past? If so, how?
6. Have you worked with or studied coding/programming? If so, in what way?

Open-ended prompts (post):

Items 1–4 above, plus:

5. What was the most interesting part of this course?
6. What were the most confusing parts of this course?



Parent Permission for Minor Participation
Consent for Research Participation
IRB #: 21-211-MAR-XPD
IRB Approval Date: 12/16/2021

Summary Statement:

The purpose of the research is to introduce school students to the field of Artificial Intelligence (AI) and learn how their attitudes towards AI change. Artificial Intelligence (AI) is a set of approaches so that computers can make automatic decisions based on pictures, sounds, and other information they are provided.

The study includes 11 after-school meetings at the Bartlett School in Lowell. It includes surveys and interviews at each meeting. There is a risk that your child may experience stress if they do not understand AI or the program activities. There is also the risk that their participation in the research is disclosed however these risks will be minimized. There are no direct benefits to your child but allowing your child to participate may improve their knowledge of AI.

Researchers: Fred Martin, PhD, Associate Dean in the Kennedy College of Sciences; Ruizhe Ma, PhD, Assistant Professor of Computer Science, and Joseph Gonzales, PhD, Assistant Professor of Psychology, UMass Lowell

We're inviting your child to participate in a 6-week, 11-session after-school program and research study. Their participation is completely voluntary. If you agree to support their participation, you can always change your mind and withdraw. There are no negative consequences, whatever you decide.

What is the purpose of this study?

The purpose of the study is to introduce students to the field of Artificial Intelligence (AI) and learn how their attitudes towards AI change.

What will my child do?

The study will consist of the following activities:

- 11 after-school program meetings held at your child's school. Each meeting will last 1 hour and 45 minutes (from 2:15 PM to 4:00 PM). A Lowell Public Schools teacher will be present along with UMass Lowell researchers and UMass Lowell student assistants. Participants will be introduced to topics in artificial intelligence.
- Surveys will be completed during the program meetings.
 - A survey will ask your child about their attitudes towards artificial intelligence, asking questions like how much they agree with the statement "Understanding how Artificial Intelligence works can help me get a good job." This will be given at the beginning and end of the program (10 mins).



Parent Permission for Minor Participation

Consent for Research Participation

IRB #: 21-211-MAR-XPD

IRB Approval Date: 12/16/2021

- o A survey will ask your child to provide their school grade, gender identity, ethnicity and whether you attended college/university. This will be given once at the beginning of the program (2 mins).
- There will be daily written and interview conversations. For example, in the unit where students compare measurements of different species of penguins, students will be asked “Which measurement(s) distinguishes the Adelie penguin (from the other two)?” The interviews will be conducted in the classroom and will be audio-recorded (10 minutes per day).

How long will it take?

There will be eleven 1 hour, 45-minute program meetings after-school. All activities will be done at school.

How many students are expected to participate?

We estimate there will be 15 to 25 students in the study.

Will it cost anything for my child to participate?

There are no costs or charges associated with participation.

Will my child receive any incentive or compensation for participating?

Upon successful completion of the program, your child will receive a T-shirt from the University of Massachusetts Lowell. They'll need to complete the surveys at the beginning and end of the program and have attended at least 8 of the 11 classes to receive the T-shirt.

Can being in this research be harmful?

With any type of research participation there is the risk for stress or disclosure. For instance, your child may become stressed if they do not understand AI or the program activities. Your child's data may also be seen by someone who shouldn't have access to it. We're minimizing the risks in the following ways:

- Your child is free to stop their participation at any time and can refuse to answer any questions.
- Your child's identifying information is removed and will be replaced with a study ID.
- We'll store all electronic data on a password-protected, encrypted file system.
- We'll keep your child's identifying information separate from the research data, but we'll be able to link it to them by using a study ID. We will destroy this link after we finish collecting and analyzing the data.



Parent Permission for Minor Participation

Consent for Research Participation

IRB #: 21-211-MAR-XPD

IRB Approval Date: 12/16/2021

- The survey data provided online has the potential to be intercepted—this is a risk everyone experiences any time they provide information online. We’re using a secure system to collect this data, but we can’t completely eliminate this risk.

There may be risks we don’t know about yet. Throughout the study, we’ll tell you if we learn anything that might affect your decision to let your student participate.

Will being in this research help my child in any way? There are no direct benefits to your child from participating in this research; however, your child will gain experience in artificial intelligence and may benefit from increasing their knowledge of this subject.

How will my child’s data be stored and when will it be destroyed?

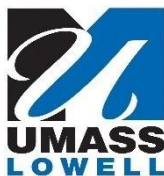
Data will be received on UMass Lowell’s survey system. Your child will be provided with a unique ID which they will use as a confidential ID when filling out the surveys. A single file containing all students’ names and the confidential IDs will be kept by the researchers and stored on UMass Lowell’s file servers. This file will be encrypted by the researchers when not in use.

Survey data will be transferred to UMass Lowell’s file servers for storage and analysis. Only approved researchers will have access to the data. Data will not be stored on individual researchers’ computers.

Data will be kept for four years after the study concludes. We might use your child’s research data in future research. If we do use your child’s data for future studies, we will not share your child’s name or other information that identifies your child directly, and we will not come back to you to ask you for your consent to use this data.

Who can see my child’s data?

- The researchers will have access to all data.
- The Institutional Review Board (IRB) at UML or the Office for Human Research Protections (OHRP) may review all the study data. This is to ensure we’re following laws and ethical guidelines.
- We may share our findings in publications or presentations. If we do, all data will be grouped together and your child's name will not be used.



Parent Permission for Minor Participation

Consent for Research Participation

IRB #: 21-211-MAR-XPD

IRB Approval Date: 12/16/2021

Other Information:

Are the researchers mandated reporter?

Yes, we are mandated reporters. This means that if we learn or suspect that a child is being abused or neglected, we're required to report this to the authorities.

Contact information:

For questions about the research, complaints, or problems: Contact Fred Martin at (978) 934-1964 (office phone), (978) 254-7532 (personal cell phone), or by email at fred_martin@uml.edu.

For questions about your rights as a research participant, complaints, or problems: Contact the UMass Lowell IRB (Institutional Review Board) at 978-934-4134 or at IRB@uml.edu

Agreement to Participate

I confirm I am volunteering freely to allow my child, named below, to participate in this research project. I have read and fully understand the purpose of the research project and its risks and benefits. I have had the opportunity to read this document and discuss my concerns and questions. By signing below, I consent to allow my child to participate in this research.

Name of my child: _____

My printed name: _____ Date: _____

My signature: _____

RESEARCHER/PERSON OBTAINING CONSENT

I have provided a copy of this document and reviewed with the participant the materials contained in this form and the participant has provided consent to participate.

Printed Name of Researcher: FRED MARTIN Date: December 7, 2021

Signature: _____



Parent Permission for Minor Participation
Consent for Research Participation

IRB #: 21-211-MAR-XPD

IRB Approval Date: 12/16/2021

Shed Mant



Minor Assent for Research Participation

IRB #: 21-211-MAR-XPD

IRB Approval Date: [Click here to type](#)

Study title	Learning AI Afterschool
Researcher[s]	Fred Martin, PhD (Associate Dean)

Unique Identifier (enter in box)

[]

We're inviting you to be in a research study and mini-course. We are trying to learn more about your how you think about Artificial Intelligence. Artificial Intelligence (AI) is a set of approaches so that computers can make automatic decisions based on pictures, sounds, and other information they are provided.

If you agree to be in this study, you will use several software systems for learning about AI and related ideas of machine learning and data science.

You'll join us for eleven 1.25-hour program meetings over six weeks with other study participants. We'll meet on Monday and Wednesday afternoons from 2:30 pm to 3:45m. We start on Mon Feb 28, 2022 and conclude on Wed Apr 6, 2022.

We will also ask you to do surveys and interviews during each program meeting. These will take about 10 to 15 minutes per program meeting and fill out a one-time survey asking you what grade you are in, your race and gender identity. (about 3 minutes). The surveys will ask you what you thought about each day's activity and may ask you to solve an AI problem or give us your ideas about AI. You do not have to answer any questions you do not want to answer.

A risk is something bad that could happen to you. Being in this study might cause you to become stressed if you do not understand AI or the program activities. You can stop participating at any time.

If you want to participate, you will gain experience in artificial intelligence and you may benefit from increasing your knowledge of this subject.

You don't have to be in this study. It is up to you. You do not have to participate even if your parent say you can. If you say yes now, but change your mind later, that's ok too. Just let us know.

When we are finished with this study, we will write a report about what we learned. This report won't have your name in it, or that you were in the study.

If you want to be in this study, click **Yes**. Otherwise, click **No**.



Minor Assent for Research Participation

IRB #: 21-211-MAR-XPD

IRB Approval Date: Click here to type
[Yes-button] [No-button]

Submit date will be captured automatically by Qualtrics.

Learning AI Afterschool - promotional description

“How Artificial Intelligence Really Works”

Are you curious how AI (Artificial Intelligence) actually works? In this afterschool program, we'll learn how computers process data and make decisions. We'll see how computers recognize images, and explore how to use AI responsibly in everyday life. We'll use a variety of software along the way. At the end of the class, you'll create a project that uses AI to solve real problems. No coding experience needed!